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USSR Report

ENGINEERING AND EQUIPMENT

(FOUO 1/81)

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JPRS L/9549

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USSR REPORT

ENGINEERING AND EQUIPMENT

(FOUO 1/81)

CONTENTS

NUCLEAR ENERGY

CHANNEL-TYPE NUCLEAR POWER REACTOR

Moscow KANAL'NYY YADERNYY ENERGETICHESKIY REAKTOR in Russian 1980 signed to press 27 Mar 80 pp 2-4, 207-208

[Annotation, foreword and table of contents from book by Nikolay Antonovich Dollezhal' and Ivan Yakovlevich Yemel'yanov, Atomizdat, 2550 copies, 208 pages]

[Text] The results are generalized, of scientific research and design work on the creation of the RBMK-1000 nuclear power reactor--the first domestic series-produced one-million-kilowatt (electric) reactor--designed for the purpose of developing the country's nuclear power. Major scientific and technical problems which were solved in the process of developing the prototype reactor are discussed. A description is given of designs of the reactor per se, of elements of the monitoring and regulating system, and of the biological shield. Theoretical calculation and experimental studies of the core and the principles of monitoring and controlling energy release fields are discussed. Questions relating to the reliability and radiation safety of the reactor are analyzed.

For scientific personnel, designers and specialists involved in developing and using nuclear power reactors; will also be useful to the instructional staff, graduate students and upper-class students at higher educational institutions specializing in nuclear power engineering.

Foreword

In keeping with the decisions of the 24th, and especially of the 25th, CPSU Congress, in our country in the 70's was developed the massive construction of nuclear power plants. This became possible because of the fact that Soviet specialists had developed, created and mastered types of reactors suitable for the economical and large-scale production of electric power. As early as the next few years AES's [nuclear power plants] with reactors of various types will assume a practically monopolistic position in the growth of electrical capacities in the European sector of the USSR.

In our country, along with pressurized-water shell-type reactors, a channel type of nuclear reactor is widely used at AES's. Its construction was suggested and implemented at the end of the 40's. As applied to power engineering problems, this design principle was used successively for the reactors of the Pervaya [First] AES, the Siberian, Beloyarsk, Bilibino and other AES's.

An important advantage of this type of reactor is the ability to realize high unit power, to improve individual indicators of an AES and to increase its economic efficiency. The first one-million-kilowatt power plant with an RBMK reactor of the boiling water type was put into service in 1973 at the Leningrad AES imeni V.I. Lenin; it became the prototype for a large series of power plants in existence and to be constructed for a number of AES's with a capacity of four to six million kilowatts and more.

RBMK reactors with a unit capacity of 1.5 million kW will be installed at the Ignalina AES under construction. An engineering project is being developed for a sectional heterogeneous channel reactor with a capacity of 2.4 million kW.

These achievements are of special meaning, special importance, for our country. The extensive construction of AES's begun in the preceding and developed in the current five-year plan period has become possible practically without considerable capital investment in the creation of a specialized machine building base for making equipment for this type of reactor. Orders for the manufacture of key equipment for the series of power plants with RBMK reactors have been placed at ordinary machine building plants.

The RBMK reactor was created on the basis of considerable work experience in the mastery of channel-type power reactors. Many teams participated in its creation. Important scientific research, calculation and design work was done at the Institute of Atomic Energy imeni I.V. Kurchatov, the Scientific Research and Design Institute of Power Equipment, and other institutes and design bureaus. The team of the Leningrad AES imeni V.I. Lenin did a great deal of work on mastering the new type of reactor, on running through operating modes, and on eliminating defects which arose in the process of debugging equipment and units.

Scientific research and design organizations in conjunction with the operating personnel of the LAES [Leningrad AES] conducted comprehensive studies of all the plant's equipment and studied the neutron-physical characteristics of the core both in the original state and in the process of operation in all of the plant's operating modes.

The extensive use of these reactors in the USSR's nuclear power engineering necessitates training skilled AES operating personnel.

This book has had the goal of generalizing the experience of creating, starting up and operating the first reactors of this type. At the same time it will aid in training AES personnel for working with reactors of this type, as well as in forming specialists in the field of nuclear power engineering.

For their assistance in this work, the authors wish to thank the following associates at the Scientific Research and Design Institute of Power Equipment(NIKIET): A.P. Sirotkin, V.V. Rylin, P.A. Gavrilov, V.G. Aden, V.V. Postnikov, A.S. Levchuk, V.I. Shubin, K.K. Polushkin, Yu. E. Khandamirov, A.I. Klemin, V.P. Vasilevskiy, N.Z. Rybakov, Yu.I. Koryakin, V.A. Chernyayev, V.I. Mikhan, Yu.M. Cherkashov, L.N. Podlazov and T.Yu. Kofanova.

CONTENTS

[126-8831]

8831
CSO: 1861

INSTALLATION OF NUCLEAR ELECTRIC POWER PLANT EQUIPMENT

Moscow MONTAZH OBORUDOVANIYA ATOMNYKH ELEKTROSTANTSIY in Russian 1980 signed to press 11 Dec 79 pp 2, 254-256

[Annotation and table of contents from book by Vladislav Vikent'yevich Girnis, Gennadiy Vasil'yevich Filatkin, Valeriy Alekseyevich Fedulov, Boris Dmitriyevich Pilkin, Antonina Nikolayevna Kovshova and Mikhail Ivanovich Poluektov, Izdatel'stvo "Vysshaya shkola", 6000 copies, 256 pages]

[Text] In this book information is presented on the installation of thermal systems of nuclear electric power plants (AES's) and on the construction of nuclear reactors. Questions relating to the organization of and methods of assembling nuclear power reactors, auxiliary equipment and pipelines of nuclear electric power plants are discussed. The fundamentals of nuclear physics are expounded.

CONTENTS

[134-8831]

8831
CSO: 1861

NUCLEAR ENERGY FOR THE GOOD OF MANKIND

Moscow YADERNUYU ENERGIYU--NA BLAGO CHELOVECHESTVA in Russian 1978 signed to press 2 Dec 77 pp 4, 391

[Annotation and table of contents from collection of works by Igor' Vasil'yevich Kurchatov, Atomizdat, 8000 copies, 391 pages]

[Text] This publication of a collection of selected works is dedicated to the 75th birthday of Academician I.V. Kurchatov. Articles and papers are included which characterize various stages in the development of work on nuclear physics and power engineering. Some results of the work done by the Institute of Atomic Power, organized and directed by Academician I.V. Kurchatov, are described.

This collection makes it possible to give an idea of the breadth of interests of the prominent Soviet scientist and outstanding statesman I.V. Kurchatov, and of the value of the results of his work.

This book is intended for a wide range of specialists working in atomic science and engineering, as well as for all who are interested in the history of atomic research in the USSR.

CONTENTS

[131-8831]

8831
CSO: 1861

CALCULATION AND DESIGN OF INDUCTION MHD MACHINES WITH A LIQUID-METAL WORKING MEDIUM

Moscow RASCHET I PROYEKTIROVANIYE INDUKTSIONNYKH MGD-MASHIN S ZHIDKOMETALLICHESKIM RABOCHIM TELOM in Russian 1978 signed to press 22 Feb 78 pp 2-4, 246-248

[Annotation, foreword and table of contents of book by Gennadiy Alekseyevich Baranov, Vasiliy Andreyevich Glukhikh and Igor' Rafailovich Kirillov, Atomizdat, 1530 copies, 248 pages]

[Text] In this book are discussed the fundamentals of the calculation and design of induction-type MHD (magnetohydrodynamic) pumps and generators with a liquid-metal working medium. The results of extensive experimental research on electromagnetic and hydrodynamic processes in these machines are presented. The most widespread kinds of design for liquid-metal MHD machines with flat, helical and cylindrical channels are discussed.

This book is intended for engineering and technical and scientific personnel working on designing MHD pumps and generators with a liquid-metal working medium, as well as for graduate students and upper-class students at VUZ's in the appropriate fields of specialization.

Foreword

Induction-type MHD machines with a liquid-metal working medium are being used ever more extensively in various sectors of the national economy, such as in nuclear power engineering, metallurgy and foundry production, the chemical industry, etc. Of definite interest also are systems for the direct conversion of heat energy into electrical, in which MHD machines are used as pumps or MHD generators. Therefore the development of engineering methods of calculating and designing liquid-metal MHD machines is a topical problem.

In monographs on induction liquid-metal machines, by A.I. Vol'dek [39], N.M. Okhremenko [116], Ya.Ya. Liyelpeter [103], Ye.I. Yantovskiy and I.M. Tolmach [157] and other authors, are discussed mainly theoretical aspects of individual questions. Insufficient attention has been paid to engineering methods of calculating and designing these machines.

In this book called to the reader's attention are discussed methods of the engineering calculation and design of MHD pumps and generators, based on the results of the authors' own developments and on the data of other teams. These methods are

based on the application of the theory of an ideal MHD machine in an electrodynamic approximation. Fringe effects of various kinds, as well as the influence of the velocity profile of a moving medium, are taken into account by means of introducing correction factors arrived at by solving individual boundary problems. The hydraulic characteristics of the working channels of machines are calculated on the basis of semi-empirical dependences arrived at from corresponding experimental data. The optimal shapes of the connecting sections of channels are also determined on the basis of experimental data.

In this book is discussed a group of theoretical, experimental and design studies conducted mainly at the Scientific Research Institute of Electrophysical Apparatus imeni D.V. Yefremov. Experimental investigations were performed on a number of full-scale models of induction MHD machines in the pump and generator operating modes with liquid metal as the working medium.

The authors of the book express their sincere gratitude to the following colleagues, who participated at various stages in working out individual problems: R.A. Alekseyev, A.M. Andreyev, V.V. Ivanov, B.G. Karasev, A.P. Ogorodnikov, V.P. Ostapenko, and G.T. Semikov.

The authors will receive with appreciation all critical comments and recommendations.

CONTENTS

[129-8831]

8831
CSO: 1861

AUTOMATIC EQUIPMENT OF AVIATION GAS TURBINE PROPULSION UNITS

Moscow AVTOMATIKA AVIATSIONNYKH GAZOTURBINNYKH SILOVYKH USTANOVOK in Russian 1980 signed to press 10 Aug 79 pp 2, 245-247

[Annotation and table of contents from book by Sergey Aleksandrovich Gayevskiy, Fedor Nikolayevich Morozov and Yuriy Pavlovich Tikhomirov, Voyenizdat, 7000 copies, 248 pages]

[Text] In this book, in a form intelligible to readers with an average technical aviation education, with the extensive use of illustrations, automatic systems for controlling aviation gas turbine propulsion units are discussed and the automatic equipment of these systems is described. The structure of the book makes it possible to study it selectively.

Intended for air force engineering and technical and flight personnel; can be used by students and cadets at military aviation educational institutions.

CONTENTS

[137-8831]

8831
CSO: 1861

CONSTRUCTION AND DESIGN OF ENGINE UNITS

Moscow KONSTRUKTSIYA I PROYEKTIROVANIYE DVIGATEL'NYKH USTANOVOK in Russian 1980 signed to press 29 Feb 80 pp 3-4, 320

[Foreword and table of contents from book by Aleksey Fedorovich Gurov, Dominik Dominikovich Sevruk and Dmitriy Nikolayevich Surnov, Izdatel'stvo "Mashinostroyeniye", 2300 copies, 320 pages]

[Text] Foreword to Second Edition

The first edition of this textbook appeared in 1970 under the title "Konstruktsiya i raschet na prochnost' kosmicheskikh elektroraketnykh dvigateley" [Construction and Calculation for Strength of Spacecraft Electric Rocket Engines].

During the time which has passed since the appearance of the first edition space technology has made a mighty step forward. People have been on the moon, Soviet automatic stations have studied the moon, and spacecraft engines have operated for prolonged periods in space, making possible, in particular, the record stay in space of Heroes of the Soviet Union, pilot-cosmonauts V.A. Lyakhov and V.V. Ryumin. Extensive data have been published on the construction and designs of parts of spacecraft engine units, the class of which has been expanded considerably. All this has made it necessary to make important additions to the textbook and to change its title.

The present edition has kept the methodological structure of the textbook used in the first.

In this textbook constructions are described and calculations are given for the strength, stability and vibrations of key parts of spacecraft engine units, including power plants and electric rocket engines (plasma jet, electrostatic and electric heating). Great attention is paid to power sources for spacecraft engine units (nuclear reactors, isotopic power supplies, solar batteries and collectors, chemical fuel cells); a description is given of designs of energy converters and of procedures for designing and calculating them. Furthermore, in the textbook has been introduced a section on magnetohydrodynamic converters, designs of colloidal-fuel and resistive engines are discussed, sections have been added, devoted to calculation of parts at the stage of creep, and questions are discussed, relating to strength reliability and shortterm fatigue strength. At the same time some material of the first edition has been somewhat abridged and partly regrouped.

Examples of designs are of an instructional nature and are not related to any specific engines and units.

Physical quantities are given in International System (SI) units, with the exception of temperature, which the authors for a number of reasons have considered advisable to leave in degrees Celsius.

Section 1.5.6, devoted to the problem of the strength of spacecraft engine units, was written by Doctor of Technical Sciences Professor D.D. Sevruk, chapter VI by Assistant Professor D.N. Surnov and the remaining material by Doctor of Technical Sciences Professor A.F. Gurov.

The authors express their sincere gratitude to Doctor of Technical Sciences A.I. Belousov, who made a number of valuable comments in reviewing the manuscript, and to Assistant Professor Yu.A. Broval'skiy.

All comments and inquiries regarding this book should be sent to the following address: Izdatel'stvo "Mashinostroyeniye," 107885, Moscow, GSP-6, 1-y Basmannyy per., 3.

CONTENTS

8831
CSO: 1861

UDC 621.455(075)

PRINCIPLES OF THE THEORY OF ELECTRIC PROPULSION SYSTEMS

Moscow OSNOVY TEORII KOSMICHESKIKH ELEKTROREAKTIVNYKH DVIGATEL'NYKH USTANOVOK in Russian 1978 signed to press 11 Jul 78 pp 2-4, 383-384

[Annotation, preface and table of contents from book "Principles of the Theory of Electric Propulsion Systems", second revised and enlarged edition by Oleg Nikolayevich Favorskiy, Viktor Veniaminovich Fishgoyt and Yevgeniy Isaakovich Yantovskiy, Izdatel'stvo "Vysshaya shkola", 4000 copies, 384 pages]

[Text] This is a textbook on space propulsion systems of a new type differing from conventional chemical rockets in the capability in principle of attaining greater specific thrusts and higher spacecraft payloads.

The book presents the principles of the theory and calculation of the most important components of such propulsion units: heat engineering facilities (sources of thermal energy and radiator-coolers), converters that change heat to electric energy of both mechanical and nonmechanical types, as well as electric thrusters.

The work is intended for students of technical academies and engineering schools, and also for engineering and technical workers in this and related fields.

Preface

The launching of the first Soviet artificial satellite into near-earth orbit on 4 October 1957, and the flight of Yu. A. Gagarin on 12 April 1961 were the triumph of socialist science and technology and the implementation of ideas of our genial compatriot K. E. Tsiolkovskiy.

Man's conquest of space poses ever newer problems for science and technology with each passing year and with every new goal. The "Main Areas of Development of the National Economy of the USSR" for 1976-1980 calls for "continuing the investigation and conquest of outer space, expanding research on the application of space facilities to the study of resources of the earth, in meteorology, oceanology, navigation, communications and for other needs of the national economy."

One of the decisive directions in improving aerospace technology is the development of flightcraft propulsion units. It was the successful development of powerful and efficient rocket engines that enabled us to take the first steps in outer space with the launching of Soviet satellites, and then within a few years to go from solo missions to the manned group missions of the Soviet Vostok series followed by

the U. S. Apollo series. The sixties saw the completion of research probe missions to the moon and near planets -- Mars and Venus -- and a soft landing on the moon.

All these missions up to 1970 were successfully handled by a single type of propulsion unit -- the chemical rocket. Electric propulsion units that had been launched up to this time, with the exception of pulsating erosion engines that use thermal acceleration of the working fluid, carried no payload; the main purpose of launching these electric rockets was to study processes taking place in the engines themselves, and to verify their workability in outer space. In subsequent years a selection was made of electric propulsion designs to meet up-to-date requirements, improvements were made, and these propulsion units gradually began to be used on satellites to carry out the direct tasks of stabilizing space vehicles and correcting their orbits. For example in late 1971 the Meteor satellite was launched with two stationary plasma engines that were used to place the vehicle in a predetermined standard synchronous orbit. The year 1974 saw the beginning of operation of the U. S. ATS-6 communications satellite with two miniature cesium ion rockets designed for stabilizing the orbit of the vehicle in a south-to-north direction. At the present time extensive space research programs and projects have been developed that include interplanetary missions using electric rockets as sustainers (the U. S. SEP project and others).

This book deals with questions of theory and calculation, selection of parameters and working fluids, designs, experiments, and matching of the individual units of electric propulsion systems for space. Despite the fact that such facilities have been infrequently used as yet, research on them has been comparatively far-reaching, and their promise, as well as the numerous theoretical and experimental papers that are even now at hand combined with the necessity of training pertinent specialists prompt us to present the material as a textbook. In recent years courses of this kind have been introduced in some schools and academies, and there are almost no textbooks available.

In writing this book, the authors have made comprehensive use not only of the specialized popular works and surveys at their disposal, but also a considerable number of their own studies, both those that have been published and are mostly cited at the end of the book, and those that were specially done in preparing the text.

The basic goal in preparing this book was to teach the student an engineering and technical approach to problems of electric propulsion with a rather detailed physical explanation of the major processes that take place in the individual elements, and presentation of principles of calculation in an up-to-date form.

Since the major types of electric propulsion systems in the next few years will be ion rockets and plasma engines with relatively low thrust, this second edition of the book examines these types in more detail and the corresponding sections have been enlarged with new materials published both in the Soviet Union and elsewhere. As to the power plants, the sections on MHD generators have been condensed in this edition, and the section on electrogasdynamic generators has been eliminated in view of the poor outlook for using such facilities in outer space; the section dealing with nuclear power sources has been updated somewhat, and the section on thermionic generator units has been considerably modified from present-day viewpoints.

Each of the authors wrote the following chapters and paragraphs directly: Doctor of Technical Sciences O. N. Favorskiy -- preface, chapter 1, §§2.5, 3.1, 4.2, 4.3, 4.5, 4.6, 5.1-5.5, sections a, d, §§5.6, 5.8, 5.9; Candidate of Technical Sciences V. V. Fishgoyt -- §§3.2 and 3.3; Doctor of Technical Sciences Ye. I. Yantovskiy -- §§2.3, 2.6, sections b-f, §5.6.

In addition to the principal authors, there were a number of scientific workers who took part in preparation of the book by writing the following sections: Candidate of Technical Sciences V. Z. Kaybyshev -- sections a-g of §5.7; Candidate of Technical Sciences Yu. V. Moskvin -- §2.4; Candidate of Technical Sciences V. M. Matveyev -- §4.4; Engineer R. G. Avalov -- §4.1; Candidate of Technical Sciences V. S. Romanychev -- §2.1 and §2.2; §5.10 was prepared by O. N. Favorskiy in cooperation with Candidate of Technical Sciences M. M. Piskunov.

The authors thank the reviewers, doctors of technical sciences, professors D. D. Sevruk and L. A. Kvasnikov, for their attentive and sympathetic inspection of this book.

Comments and requests should be addressed to "Vysshaya shkola": Moscow, K-51, Neglinnaya ul., d. 29/14

Contents

[141-6610]

6610
CSO: 1861

USE OF GYROSCOPIC INSTRUMENTS AND SYSTEMS ON OCEAN VESSELS

Moscow PRIMENENIYE GIROSKOPICHESKIKH PRIBOROV I SISTEM NA MORSKIKH SUDAKH in Russian 1977 signed to press 24 Oct 77 pp 2, 259-261

[Annotation and table of contents from book by Mikhail Mitrofanovich Bogdanovich, Izdatel'stvo"Transport", 3000 copies, 261 pages]

[Text] In this book are discussed the fundamentals of the theory and the principles of the operation of navigation gyroscopic instruments and systems used on ocean vessels as meridian, vertical direction, tossing angle, angular velocity and acceleration, and linear velocity indicators, as well as of those used as stabilizing devices. Special attention is paid to determination of their accuracy under conditions of actual use and to ways of improving it.

Several new instruments and systems are discussed, e.g., gyro latitude compasses and multi-purpose systems.

This book is intended for navigation personnel and is recommended by the Ministry of the Maritime Fleet Educational Institution Administration as a textbook for navigation majors at marine engineering higher educational institutions. It can also be useful to scientific personnel.

CONTENTS

[135-8831]

8831
CSO: 1861

UDC 629.014.69-506.4.001

AUTOMATION OF AIRCRAFT PILOTING AND AIR TRAFFIC CONTROL

Moscow AVTOMATIZATSIYA SAMOLETOVOZHDENIYA I UPRAVLENIYA VOZDUSHNYM DVIZHENIYEM in Russian 1980 signed to press 9 Jan 80 pp 2, 354-357

[Annotation and table of contents from book by Pavel Artem'yevich Agadzhanov, Vladimir Georgiyevich Vorob'yev, Al'bert Andreyevich Kuznetsov and Yevgeniy Davydovich Markovich, Izdatel'stvo "Transport", 6,000 copies, 357 pages]

[Text] The book presents the basic concepts of aircraft piloting, theory of flight control, principles of designing airborne pilot-navigation complexes, and particulars of hardware realization. An examination is made of the basic principles of organization, planning, operational control and support of air traffic, as well as problems of collecting, processing and imaging information on the air situation. Principles are given on the control of air traffic en route and in the vicinity of airports.

The book is intended for technicians and radio operators who use automated air traffic control systems, and may also be of use to the engineering and technical staff of operational civil aviation enterprises.

[138-6610]

6610
CSO: 1861

UDC 62-50

ULTIMATE CAPABILITIES OF CONTROL SYSTEMS WITH CONSTRAINTS ON STATE VEHICLES

Moscow PREDEL'NYYE VOZMOZHNOSTI SISTEM UPRAVLENIYA PRI OGRANICHENIYAKH NA PEREMENNYYE SOSTOYANIYA in Russian 1979 signed to press 26 Jun 79 pp 2-4, 160

[Annotation, preface and table of contents from book by Il'ya Davidovich Kochubiyevskiy and Yevgeniy Vasil'yevich Korol', Izdatel'stvo "Nauka", 1240 copies, 160 pages]

[Test] The monograph examines the influence that natural constraints have on the operation of dynamic systems. The boundaries of a set are determined that are permissible for given limitations of states, and an investigation is made of the way that the limiting permissible values of the major qualitative characteristics of systems (temporal, spectral and informational) depend on the restrictions on state variables. Recommendations are made on selecting parameters of the elements of automatic control systems.

The book is intended for specialists in the theory, development and experimental investigation of automatic control systems.

Preface

The question of the ultimate capabilities of automatic systems as formulated by A. A. Fel'dbaum is always of concern to developers, starting with feasibility studies, and ending with testing of series-produced systems. Essentially, the designer's task is to be able to make decisions about the behavior of the final complete system from attainable parameters of major elements in the initial planning. Obviously, in doing this it is possible to consider only estimates of the ultimate capabilities of the system, i. e. estimates of the maximum attainable values (with given elements) of the principal qualitative characteristics of the system, and these estimates must not depend on details of structure, type of correcting links, control method and so on. In other words, it is required to get a fairly reliable, albeit incomplete, idea of system behavior before final development.

In such an approach to this question, the necessity arises not so much for a strict mathematical formulation of the problem of ultimate capabilities of automatic systems, as for a reliable estimate of capabilities of a system after manufacture. Such an estimate will help shorten the path to development of a system that meets specific technical requirements. It will show the developer whether he is on the right track.

Of no less importance is the problem of the developer's inputs to get such a prognostic estimate. The methods of obtaining it must be adequately workable, and in necessary cases must be approximate, since excessively cumbersome calculation that requires voluminous and varied input data may cancel all advantages of precise determination of the optimum values of quality criteria of the system.

Any problem that involves designing and using real objects leads to a finite scheme that is to be understood in the sense of a finite number of state variables to be considered, and a finite number of distinguishable limited values of each variable. The structural complexity of real objects is a quite considerable impediment to the design of "good" (idealized) analytical models that match the results of observations. A finite scheme of a real object facilitates construction of a variety of computational methods as computational models that reflect with fair accuracy the actual properties of the technological object of control. Among such, we might mention suggested methods of constructing and studying limiting motions and sets of permissible states of systems.

The authors have set themselves the task of developing methods of estimating the ultimate capabilities of automatic control systems with respect to constraints on their state variables. The concept on which these methods is based is as follows.

If the technological object of control is described by an ordinary differential equation of n-th order, then the process at its output is described by a function that has at least n derivatives. Consequently the Hadamard-Kolmogorov condition is satisfied for such an analytical function, i. e. there is a mutual relation between the set of limiting values of the function and its derivatives (the state variables of the technological object of control) on the one hand, and the class of functions that satisfy this set (i. e. the classes of processes in the technological object of control) on the other.

Since the constraints on state variables are determined by structural peculiarities of the major elements of the system, by their mechanical or electrical strength and the like, and may be determined or assigned in the initial planning, an investigation of the mutual relation between these constraints and the class of possible limiting motions of the system (object) will give an estimate of its ultimate capabilities. Such an estimate should be compared with experimental data obtained for the actual system. If the comparison gives an acceptable result, then the proposed methods will have potential applicability.

Chapter 1 justifies the necessity of formulating problems and demonstrates their historical and logical development.

Chapter 2 gives the physical and intuitive fundamentals for finding ways to solve the formulated problems. In showing the dependence of the major characteristics of limiting motions of systems on the constraints on their state variables, the authors have deemed it necessary not only to give a deeper presentation of the proposed material, but to help the reader in real practical cases where it is necessary to bridge the gap between the indistinct reality and the rigorous mathematical model.

Chapter 3 is an introduction to a certain formal approach that lays the foundation for constructing the limits of sets of states of systems that are permissible with given constraints (sets of permissibility). Chapter 4 presents an analysis of the

properties of sets of permissibility of second-order systems. Such systems are simple enough to graphically exemplify different formulations and solutions of problems. The fifth chapter generalizes the properties of sets of permissibility and develops a technique for constructing their boundaries from the constraints on state variables of the systems.

In chapters 6 and 7 an investigation is made of the way that the limiting admissible values of the major qualitative characteristics of systems (temporal, spectral, informational) depend on the restrictions on state variables. In these chapters, as well as in the fifth chapter, a general procedure is given for solving the problems formulated in the first chapter.

Chapter 8 contains examples of practical application, and their possible simplification for solving the corresponding problems.

Contents

6610
CSO: 1861

FLUID MECHANICS

TURBULENT DETACHED FLOWS

Moscow TURBULENTNYYE OTRYVNYYE TECHENIYA in Russian 1979 signed to press 21 Nov 79 pp 2-4

[Annotation and table of contents from book by Lev Vladimirovich Gogish and Georgiy Yurevich Stepanov, Izdatel'stvo "Nauka", 2900 copies, 368 pages]

[Text] In this book are discussed modern notions regarding detached flows originating when a viscous fluid or gas flows around bodies, along with approximation methods of calculating them, which are illustrated by solutions to some topical problems in hydro- and aerodynamics.

A critical survey is given of models and calculation diagrams of two-dimensional (plane and axisymmetric) detached flows over a broad range of M and R numbers. Described in more detail is an integral method, developed by the authors, of calculating turbulent flows with weak (non-detached) and strong (detached) interaction between dissipative and non-viscous flows.

This book is intended for scientific personnel and engineers interested in the theory of detached flows, in particular, as applied to calculation of aircraft and aviation and power engines; this book can also be useful to teachers, graduate students and students at appropriate VUZ's.

CONTENTS

8831
CSO: 1861

PROPELLERS FOR SHIPS WITH DYNAMIC PRINCIPLES OF BUOYANCY

Leningrad DVIZHITELI SUDOV S DINAMICHESKIMI PRINTSIPAMI PODDERZHANIYA in Russian 1979 signed to press 14 Aug 79 pp 2, 237-239

[Annotation and table of contents from book by Aleksandr Alekseyevich Rusetskiy, Izdatel'stvo "Sudostroyeniye", 3800 copies, 240 pages]

[Text] Pursuant to the program of the course titled "Ships with New Principles of Propulsion," a classification is given of the major types of propellers for ships with dynamic principles of buoyancy and their operating principle is described. The fundamentals of the theory and design of screw propellers, water-jet propellers and air screws are discussed and their interaction with the hull and supporting surfaces of the vessel is considered. A description is given of propellers with controllable hydrodynamic characteristics.

This textbook is intended for students of shipbuilding VUZ's and departments and for cadets at nautical schools. Shipbuilding engineers working on the design, construction and utilization of ships with dynamic principles of buoyancy will pick up much useful information from it.

CONTENTS

[130-8831]

8831
CSO: 1861

UDC 532

DETACHED AND UNDETACHED FLOW OF AN IDEAL FLUID AROUND SLENDER WINGS

Moscow OTRYVNOYE I BEZOTRYVNOYE OBTEKANIYE TONKIKH KRYL'YEV IDEAL'NOY ZHIDKOST'YU in Russian 1978 signed to press 13 Jun 78 pp 2-6

[Annotation and table of contents from book by Sergey Mikhaylovich Belotserkovskiy and Mikhail Ivanovich Nisht, Izdatel'stvo "Nauka", 3000 copies, 352 pages]

[Text] The book gives a systematic exposition of the nonlinear theory of a wing, and numerical methods of digital computer calculation of detached and undetached flow around wings of any planform, their flaps and interceptors, foil cascades and so forth.

General approaches are given that are based on a model of an inviscid incompressible fluid. An examination is made of two-dimensional, axisymmetric and three-dimensional flows. Results are given from systematic calculations of nonlinear (steady and unsteady) aerodynamic characteristics of various lifting surfaces, the characteristics of the wake behind them and comparisons with experimental data.

The book is written for scientists, engineers, graduate and undergraduate students majoring in the field of aerodynamics, hydrodynamics, flight dynamics and aeroelasticity.

Contents

[125-6610]

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REACTOR THERMOMETRY

Moscow REAKTORNAYA TERMOMETRIYA in Russian 1980 signed to press 18 Mar 80 pp 2-4, 199-200

[Annotation, foreword and table of contents from book by B.V. Lysikov and V.K. Prozorov, Atomizdat, 1200 copies, 200 pages]

[Text] This book treats a specific branch of thermometry--thermometry of nuclear reactors.

In 1975, the book "Temperature Measurements in Nuclear Reactors" was published with participation of the same authors. Since that time, considerable progress has been made in the development of methods for measuring temperatures of the main elements of the core. This book is a logical continuation of that book. It gives the results of studies on the behavior of primary thermal converters in the core and examines the latest achievements in the area of standard means of intracore temperature monitoring. The authors analyzed more concretely and widely than before the specific characteristics of temperature measurements in reactors of various types.

The book is intended for engineers, technicians, and scientists engaged in the development, designing, and operation of AES [atomic power plants]. It can be used by graduate and upper division students in these fields.

Tables, 16; figures, 73; bibliography, 238 items.

Foreword. The use of nuclear reactors in large-scale power engineering and the prospects of their use in other branches of industry (for example, in the chemical and metallurgical industries, as well as for producing industrial heat and for central heating) determine the ever increasing requirements for the economy, reliability, and safety of reactors.

One of the means of ensuring these requirements is temperature monitoring of the limiting parameters of the core and its elements (fuel elements, moderator, heat-transfer agent, structural assemblies). The necessity of obtaining direct information about these parameters has determined the development of methods of intracore temperature measurements which started in the 1960's and continues at the present time.

The thermometry of nuclear reactors is characterized by a complex of factors determining the methods and means, metrological characteristics, and methodology of

temperature measurements. At the present time, the reactor thermometry as one of the branches of the general thermometry is of great importance for increasing the effectiveness of newly developed reactors and improvement of the existing reactors.

It is logical that specialists are interested in scientific and technical problems of reactor thermometry. However, there is a shortage of published materials on intracore reactor measurements at the present time.

During the time since the publication of the first book on reactor thermometry*, technical periodicals published new data some of which the authors felt necessary to include in this book along with the results of their studies. The authors give special attention to the methodological aspects of reactor thermometry which primarily have to do with primary thermal converters.

Much attention is given in the book to the problems of studying the core thermophysics and specific effects of measurement conditions on thermal converters. Therefore, the authors considered it appropriate to enlist the cooperation of specialists on these problems in writing individual sections: V. I. Donetskiy, who wrote Section 3.4, and N. S. Lavrukhin, who wrote Section 5.2.

The authors realize that this book is not without shortcomings, and will be grateful to the readers for their remarks and suggestions on the material included in the book. The authors are grateful to S. K. Petrunin, P. A. D'yakov, and A. V. Dudorov for their help in the creation and designing of the book.

Contents

*"Temperaturnyye izmereniya v yadernykh reaktorakh" [Temperature Measurements in Nuclear Reactors] by B. V. Lysikov, V. K. Prozorov, V. V. Vasil'yev, et al, Moscow, Atomizdat, 1975

10,233
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CHEMICAL MONITORING OF WATER CONDITIONS AT ATOMIC POWER PLANTS

Moscow KHIMICHESKIY KONTROL' VODNOGO REZHIMA ATOMNYKH ELEKTROSTANTSIY in Russian 1980 pp 2-4, 206-207

[Annotation, foreword, and table of contents from book by O. I. Martynova, L. M. Zhivilova, and N. P. Subbotina, Atomizdat, 207 pages]

[Text] The authors described and generalized the problems of the organization of chemical monitoring of water conditions at atomic power plants. They examined main characteristics and water quality indexes both of the heat-transfer agent and of the working substance for AES [atomic power plants] with reactors of various types, formulated requirements for the methods of manual and automatic chemical monitoring, and described these methods.

Principles of the organization of chemical monitoring of water conditions of various sections of the steam and water channel of AES are given and schemes of chemical monitoring and specific characteristics of devices for representative selection and preparation of samples, as well as methods of processing and evaluation of the results of analyses, are described.

This book is intended for engineers and technicians engaged in designing and operation of AES. It can be used by students of higher educational institutions in studying such subjects.

Figures -- 71, tables -- 41, bibliography 36 items.

Foreword. The significance of chemical monitoring of water conditions at atomic power plants for ensuring the reliability and safety of their operation increases every year. At the same time, there have been practically no specialized publications on these problems in our country or abroad except occasional articles in periodicals and publications on methods for departmental use.

For this reason, the authors attempted to explain the role of chemical monitoring of the chemical conditions of water as a means of ensuring a reliable and econimical operation of individual elements of the AES equipment. They showed the dependence of chemical monitoring on the specific characteristics of the plant. They gave theoretical principles of the methods of manual and automatic chemical monitoring complex types of water with various impurities, generated steam, reagents, etc,

which are characteristic of the water facilities of a modern plant. In accordance with the requirements of technical progress, primary attention is given to automated methods of monitoring which are increasingly replacing the manual methods of analyses.

Naturally, because of the small size of this book, attention is given only to the main points, i.e., it does not contain detailed descriptions of any monitoring methods and does not discuss the monitoring of all kinds of water flows constituting the water management of an atomic power plant. The authors are compelled to limit themselves to the examination of the characteristics of water conditions only for the main circuits of the plant connected with the selection for monitoring the most representative chemical indexes of water quality and, finally, of the recommended schemes and methods of chemical monitoring.

Because of the nature of their work, the authors of the book had to engage themselves in some studies in the area of chemical monitoring and to acquaint themselves with its organization at electric power plants in the USSR and abroad. Some of the appropriate materials are used in the book. References to published sources make it possible to obtain more complete information on each of the problems discussed.

In writing this book on chemical monitoring of water conditions of atomic power plants published in the USSR, the authors used the results of studies conducted by teams under their direction: The Department of Water and Fuel technology of the Moscow Power Engineering Institute and the Laboratory of the Automation of Chemical Monitoring and Water Treatment at Electric Power Plants of the All-Union Heat Engineering Institute.

The authors realize that their first attempt at generalizing the main requirements for the organization of chemical monitoring of water conditions at atomic power plants, its optimal schemes and methods of their realization is bound to have some shortcomings. Therefore, the authors will be grateful for any remarks, additions, and suggestions addressed to the publishers.

Chapters 1-8 of the book, as well as the foreword and the introduction are written by O. I. Martynova, Chapters 9-13 and 16 are written by L. M. Zhivilova, Chapter 14 -- by them jointly, and Section 2.1 -- by N. P. Subbotina.

Contents

[144-10233]

10,233
CSO: 1861

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